Epoch.	O	C	O−C	O	C	O−C	Observer.
	°	°	°	″	″	″	
1883·32	361·2	361·8	−0·6	1·41	1·33	+·08	Eng.
83·86	361·7	1·8	−0·1	1·27	1·32	−·05	Per.
84·12	361·9	2·1	−0·2	1·27	1·31	−·04	Eng.
85·25	364·1	3·1	+1·0	1·35	1·30	+·05	Schi.
85·28	362·0	3·1	−1·1	1·15	1·30	−·15	Per.
87·01	365·2	5·1	+0·1	1·15	1·28	−·13	Schi.
88·05	367·4	6·1	−1·3	1·18	1·27	−·09	Schi.
88·51	366·1	6·6	−0·5	1·21	1·26	−·05	Lev.
1891·08	369·2	368·8	+0·4	1·35	1·25	+·10	Maw.*

Proper Motions of Twenty Southern Stars.
By J. L. E. Dreyer, Ph.D.

In the *Monthly Notices* for May 1886 I discussed the Proper Motions of twenty-nine telescopic stars occurring in the Second Armagh Catalogue of Stars. In the present paper I have put together the positions from all available sources of twenty stars which seem endowed with proper motion, which (with two exceptions) has not been noticed before, at least so far as I am aware.

These stars are all situated in the region covered by the southern *Durchmusterung*, viz. between 2° and 23° south declination. In 1881 the late Professor Schönfeld suggested to me to observe about nine hundred stars, of which the earlier observations differed considerably *inter se* or from the Bonn zones. These stars were accordingly observed with the Dunsink Meridian Circle by myself, and afterwards by Mr. Rambaut, and the resulting places for 1885 were published in part vi. of the *Dunsink Observations*. I have recently examined the more remarkable cases which might arise from proper motion, but only in twenty cases could such be established with certainty, while a number of other cases must be deferred until further observations have been obtained. I have also passed over a number of stars the proper motions of which have been determined elsewhere.

As the materials were rather scanty, and will ere long be considerably improved by the publication of the Paris Catalogue and the southern zone-work of the Astronomische Gesellschaft, I have not applied any of the so-called systematic corrections to

* The last measure, a mean of three nights, was kindly made for me by Mr. W. H. Maw, for comparison after the orbit was computed. The angle agrees well with that computed.

the various catalogues. All the places were reduced to 1875 with Struve's constant, and where there were more than three different epochs the proper motion was deduced by the method of least squares. Lalande's and Bessel's observations were reduced anew with Von Asten's and Luther's tables. The new editions of Argelander's (Oeltzen's) and Lamont's catalogues were used.

S.D. $-12°$, 20; Magn. 8·3.

		h m s	° ′ ″	
Bessel	1823·8	0 7 37·18	−11 59 50·8	(1 obs.)
Greenwich 6-Year	1852·9	37·72	57·3	(1)
„ 7-Year	1854·9	37·73	57·1	(3)
Santini	1857	37·90	56·1	(2)
Yarnall	1862·0 and 60·5	37·88	57·9	(2, 3)
Schjellerup	1863·0	37·89	59·4	(1)
Königsberg (*A.N.* 1804)	1869·9	38·27	63·0	(2)
Dunsink	1882·5	38·65	62·7	(3)

Giving Bessel, Six-Year Cat., Schjellerup and Königsberg half-weight, the P.M. is found $= + 0^s·0218$ and $-0''·172$, with which these places become:

	h m s	° ′ ″
Bessel	0 7 38·30	−11 59 59·6
6-Year	38·20	61·1
7-Year	38·17	60·6
Santini	38·29	59·2
Yarnall	38·16	60·4
Schjellerup	38·15	61·5
Königsberg	38·38	63·9
Dunsink	38·49	61·4

S.D. $-7°$, 603; Magn. 8·2.

		h m s	° ′ ″	
Lalande	1796·7	3 22 7·15	−6 57 18·4	(1)
Bessel	1824·9	8·30	25·7	(1)
Paris	1860·5 and 1862·0	9·03	31·4	(2, 1)
Dunsink	1882·0	9·73	36·2	(2)

The P.M. in R.A. has been remarked by M. Bossert, but the new reduction of Bessel's observation clearly shows that there is also motion in declination. With P.M. $= + 0^s·0299$ and $-0''·206$ the observed places become:

	h m s	° ′ ″
Lalande	3 22 9·49	−6 57 34·5
Bessel	9·80	36·0
Paris	9·46	34·1
Dunsink	9·52	34·8

S.D. −10°, 2857; Magn. 7·6.

		h m s	° ′ ″	
Lalande	1798·2	9 26 24·48	−10 38 9·4	(1)
Munich	1845·3	23·87	7·5	(1)
Brussels	1869·8 and 1867·0	23·49	5·2	(5, 4)
Dunsink	1883·2	23·03	6·2	(4)

Giving the two first places half-weight, we find P.M. $= -0^s{\cdot}0171$ and $+0''{\cdot}032$, which gives:

	h m s	° ′ ″
Lalande	9 26 23·17	−10 38 7·0
Munich	23·36	6·6
Brussels	23·40	5·0
Dunsink	23·17	6·5

S.D. −10°, 2998; Magn. 8o.

		h m s	° ′ ″	
Bessel	1824·2	10 2 20·18	−10 30 26·4	(2)
Santini	1857	19·68	20·0	(2)
Munich	1865·3	19·48	19·5	(1)
Gould	1878·2	19·30	20·6	(5)
Dunsink	1883·2	19·20	21·0	(4)

There does not seem to be any motion in declination. Adopting P.M. $= -0^s{\cdot}0172$, the observed Right Ascensions become:

	h m s
Bessel	10 2 19·31
Santini	19·37
Munich	19·31
Gould	19·36
Dunsink	19·34

S.D. −5°, 3071; Magn. 8·0.

		h m s	° ′ ″	
Bessel	1824·2	10 21 60·14	−5 56 59·2	(1)
Munich	1862·3	58·90	57 9·0	(4)
Schjellerup	1863·3	58·72	9·9	(1)
Dunsink	1883·2	58·41	15·1	(4)

Giving Bessel and Schjellerup half-weight, P.M. = $-0^s{\cdot}0296$ and $-0''{\cdot}264$, with which the observed places become:

	h m s	° ′ ″
Bessel	10 21 58·64	−5 57 12·6
Munich	58·52	12·4
Schjellerup	58·37	13·0
Dunsink	58·65	12·9

S.D. −17°, 3488; Magn. 8·2.

		h m s	° ′ ″	
Lalande	1796·3	11 45 19·51	−17 28 18·7	(1)
Bonn	1853·2	19·57	34·2	(1)
Bonn	1864·3	19·63	35·9	(1)
Dunsink	1882·9	19·76	38·7	(3)

The P.M. in R.A. is somewhat uncertain, and in declination it is just possible that Lalande is merely 15″ in error. However a P.M. = $+0^s{\cdot}0028$ and $-0''{\cdot}231$ agrees thus with the observed places:

	h m s	° ′ ″
Lalande	11 45 19·73	−17 28 36·9
Bonn	19·63	39·2
Bonn	19·66	38·4
Dunsink	19·74	36·9

S.D. −5°, 3444; Magn. 8·0.

		h m s	° ′ ″	
Lalande	1795·3	12 4 57·17	− 5 13 28·9	(1)
Bessel	1823·3	56·39	28·7	(2)
Munich	1850·8	56·00	34·2	(2)
Bonn	1855·3	55·90	33·2	(2)
Dunsink	1882·7	55·24	37·7	(2)

Giving Lalande half-weight, the P.M. is found = $-0^s{\cdot}0214$ and $-0''{\cdot}112$, which gives:

	h m s	° ′ ″
Lalande	12 4 55·46	− 5 13 37·8
Bessel	55·28	34·5
Munich	55·48	36·9
Bonn	55·58	35·4
Dunsink	55·40	36·8

S.D. −10°, 3457; Magn. 8·6.

		h m s	° ′ ″	
Lalande	1798·2	12 16 5·87	−10 51 52·0	(1)
Munich	1868·4	6·99	54·2	(2)
Dunsink	1883·0	7·17	58·9	(3)

Assuming P.M. = + $0^s.015$ and − $0''.10$, these places become:

	h m s	° ′ ″
Lalande	12 16 7.02	−10 51 59.7
Munich	7.09	54.9
Dunsink	7.05	58.1

S.D. −7°, 3409; Magn. 6.3.

		h m s	° ′ ″	
Lalande	1795.3	12 21 31.62	− 7 58 53.4	(1)
Bessel	1824.3	31.78	59 2.9	(1)
Brisbane	...	...	1.1	(1)
Taylor	1835	31.35	2.9	(2)
Santini	1843	31.09	7.1	
Cape 1850	1852.4	31.00	3.1	(1)
Brussels	1866.8, 1867.5	30.71	5.0	(4, 5)
Armagh	1873.1	30.65	6.8	(5)
Greenwich 9-Year,	1876.4	30.53	4.0	(3)
Gould	1877.5	30.52	5.3	(4)
Dunsink	1882.3	30.50	5.4	(2)

Probably Lalande should be corrected by − 10″, and there is scarcely any indication of P.M. in declination. Giving the five last places double weight, we find the P.M. in R.A. = − $0^s.0174$, which makes the observed places agree as follows:—

	h m s
Lalande	12 21 30.23
Bessel	30.90
Taylor	30.65
Santini	30.53
Cape 1850	30.61
Brussels	30.57
Armagh	30.62
Greenwich	30.55
Gould	30.56
Dunsink	30.63

S.D. −2°, 3528; Magn. 8.5.

		h m s	° ′ ″	
Lalande	1795.3	12 23 22.22	−2 36 32.2	(1)
Munich	1843.9	20.79	56.0	(2)
Dunsink	1882.8	20.76	37 24.1	(2)

Lalande only observed the transit over one wire, and does not give any fraction of the observed second. In declination there seems to be P.M. equal to about $-0''\cdot66$, which gives:

Lalande	$-2°\ 37'\ 26''\cdot8$
Munich	$16\cdot5$
Dunsink	$19\cdot0$

If Lalande should be $10''$ in error, a larger P.M. would make the agreement much better.

S.D. $-8°$, 4352; Magn. 8·8.

Bessel	1823·4	$16^h\ 48^m\ 51^s\cdot85$	$-8°\ 5'\ 25''\cdot0$	(1)
Dunsink	1886·2	47·86	6 20·2	(1)

Unless there is some error in Bessel's position, this is a very remarkable case of P.M., $= -0^s\cdot063$ and $-0''\cdot88$, or $1''\cdot3$ along a great circle.

S.D. $-22°$, 4475; Magn. 8·5.

Lalande	1795·5	$17^h\ 51^m\ 26^s\cdot85$	$-22°\ 21'\ 41''\cdot1$	(1)
Argelander	1850·0	26·14	49·4	(2)
Dunsink	1885·5	25·38	56·6	(1)

Adopting a P.M. $= -0^s\cdot019$ and $-0''\cdot16$, these places become:

Lalande	$17^h\ 51^m\ 25^s\cdot34$	$-22°\ 21'\ 53''\cdot8$
Argelander	25·66	53·4
Dunsink	25·58	54·9

S.D. $-6°$, 4817; Magn. 8·6.

Lalande	1796·5	$18^h\ 31^m\ 16^s\cdot86$	$-6°\ 53'\ 11''\cdot8$	(1)
Bessel	1824·5	16·21	31·8	(1)
Munich	1867·2	16·00	44·1	(2)
Dunsink	1886·1	15·83	52·1	(2)

Giving the last two places double weight, the P.M. is found $= -0^s\cdot0098$ and $-0''\cdot420$, which gives:

Lalande	$18^h\ 31^m\ 16^s\cdot09$	$-6°\ 53'\ 44''\cdot8$
Bessel	15·72	53·0
Munich	15·92	47·4
Dunsink	15·94	47·5

S.D. $-4°$, 4617; Magn. 9·0.

		h m s	° ′ ″
Lalande	1794·6	18 47 47·24	− 4 43 56·8 (1)
Bessel	1824·5	47·17	44 21·7 (1)
Munich	1857·0	47·02	31·7 (3)
Dunsink	1886·6	46·68	47·6 (1)

Giving the Munich place double weight, the P.M. is found $= -0^{s}{\cdot}0063$ and $-0''{\cdot}521$, which gives:

	h m s	° ′ ″
Lalande	18 47 46·73	− 4 44 38·7
Bessel	46·85	48·0
Munich	46·91	41·1
Dunsink	46·75	41·6

S.D. $-6°$, 5360, Magn. 8·5.

		h m s	° ′ ″
Lalande	1794·5	19 58 39·22	− 6 56 8·9 (1)
Taylor	1835	39·25	15·6 (2, 3)
Munich	1854·0	39·14	18·2 (4)
Schjellerup	1862·6	38·85	17·2 (1)
Gould	1880·7	38·76	19·0 (3)
Dunsink	1884·6, 85·6	38·76	18·2 (1, 1)

Giving Munich and Gould double weight the P.M. is found $= -0^{s}{\cdot}0076$ and $-0''{\cdot}094$, which, applied to the observations, gives:

	h m s	° ′ ″
Lalande	19 58 38·61	− 6 56 16·5
Taylor	38·87	19·4
Munich	38·98	20·2
Schjellerup	38·76	18·4
Gould	38·80	18·5
Dunsink	38·83	17·2

S.D. $-8°$, 5318, Magn. 8·7.

		h m s	° ′ ″
Lalande	1794·6	20 13 1·01	− 8 49 52·0 (1)
Munich	1846·6	1·04	50 12·5 (1)
Dunsink	1881·7	1·01	16·3 (2)

In Right Ascension there is evidently not any P.M., and in Declination the agreement cannot be made very good. P.M. $= -0''{\cdot}23$ gives:

	° ′ ″
Lalande	−8 50 10·5
Munich	19·0
Dunsink	13·8

S.D. – 21°, 6035, Magn. 8·4.

		h m s	° ′ ″	
Lalande	1795·6	21 25 23·56	–21 30 6·9	(1)
Munich	1847·8	22·63	6·8	(1)
Argelander	1849·6	22·50	9·0	(1)
Dunsink	1884·2	21·91	15·4	(2)
Cincinnati	1885·7	21·85	11·5	(4)

The last two places were given double weight. P.M. = – 0^s·0196 and – 0″·078 gives :

	h m s	° ′ ″
Lalande	21 25 22·00	–21 30 13·1
Munich	22·10	8·9
Argelander	22·00	11·0
Dunsink	22·09	14·7
Cincinnati...	22·06	10·7

S.D. – 16°, 6046, Magn. 6·5.

		h m s	° ′ ″	
Lalande	1795·7	22 7 51·80	–16 25 0·0	(2)
Argelander	1849·6	51·70	17·8	(1)
Rümker (Kam.)	1855 ?	52·07	26·0	(1)
Gould	1877·8	51·98	32·0	(4)
Dunsink	1881·8	52·17	37·5	(1)

These places give a P.M. = + 0^s·0028 and – 0″·414, which, applied to the observations, gives :

	h m s	° ′ ″
Lalande	22 7 52·02	–16 25 32·8
Argelander	51·77	28·3
Rümker	52·13	34·3
Gould	51·97	30·8
Dunsink	52·15	34·7

S.D. – 18°, 6140, Magn. 7·8.

		h m s	° ′ ″	
Lalande	1795·7	22 26 19·27	–18 8 27·5	(2)
Piazzi	1800 ±	19·07	30·5	(3)
Taylor	1835	19·05	31·9	(3, 3)
Argelander	1849·8	18·32	30·2	(2)
Gould	1879·7	18·09	33·8	(3)
Dunsink	1882·4	18·19	35·6	(3)

The Proper Motion is $= -0^s{\cdot}0133$ and $-0''{\cdot}065$, which gives:

	h m s	° ′ ″
Lalande	22 26 18·22	−18 8 32·7
Piazzi	18·07	35·4
Taylor	18·52	34·5
Argelander	17·98	31·8
Gould	18·15	33·5
Dunsink	18·29	35·1

S.D. −10°, 6008, Magn. 6·8.

		h m s	° ′ ″	
Lalande	1798·3	22 46 9·69	−10 43 20·6	(2)
Bessel	1823·7	10·43	25·4	(1)
Santini	1843	10·28	20·9	(1)
Munich	1845·4	10·56	20·1	(2)
Geneva	1847·6	10·50	23·1	(5)
Rümker	1849·8	10·50	20·9	(1)
Santini	1857·0	10·46	19·7	(3)
Berlin (Kam.)	1862·7	10·89	20·6	(1)
Armagh	1873·7	10·81	19·9	(2)
Gould	1878·8	10·99	21·6	(4)
Dunsink	1882·7	11·02	20·1	(3)

The late Professor C. H. F. Peters pointed out in the *Astr. Nachr.*, No. 2247, that this star had probably P.M. in Right Ascension. The above more complete collection of positions shows that this is indeed the case, the amount being $+0^s{\cdot}0159$, which gives:

	h m s
Lalande	22 46 10·91
Bessel	11·25
Santini	10·79
Munich	11·03
Geneva	10·94
Rümker	10·90
Santini	10·75
Berlin	11·09
Armagh	11·02
Gould	10·93
Dunsink	10·90

On the Orbit of the Periodic Comet 1867 I.
By Ludwig Becker, Ph.D.

(*Communicated by Professor R. Copeland*).

I.

This faint comet was discovered by M. Stephan at Marseilles on January 22, 1867, and a week later independently by W. Tempel. At first it appeared like a pretty bright round nebula with a well-defined nucleus, which by its eccentric position suggested the existence of a fan-shaped tail. Its intensity increased a little up to the first week of February, at which time the nucleus was elongated and the nebulous mass surrounding it was about 1′·5 in diameter, but somewhat extended in position-angle 75°. By the end of February the diameter had increased to 2′, and the intensity of the nucleus had gone down to that of a star of the 12th magnitude. The comet was last observed on April 4, when the 15-inch refractor of the Harvard College Observatory showed it as a very faint object.

There are 63 observations, which, extending over 69 days, cover a heliocentric arc of 41°·6, viz. from $v=3°·3$ to 44°·9. 39 of them belong to the first 17 days. I am much indebted to M. Stephan for having forwarded a fine series of observations hitherto unpublished, which have extended the time of observation by 10 days.

At the time of the comet's visibility parabolic elements were published in the *Astronomische Nachrichten* by Messrs. Valentiner, Oppolzer, and Vogel, while Mr. Searle derived elliptic elements with a period of 33·62 years from three observations which embrace almost the whole heliocentric arc.

II.

Although Mr. Searle's elements represent the observations very well, I preferred to base these computations on elements which I had computed some years ago at the suggestion of my esteemed teacher, the late Professor Schönfeld, of Bonn, from all the observations, except those made at Marseilles. This was before the comparison stars had been redetermined. These elements are—

Elements I.

T = 1867, January, 20·51309, Berlin M.T.

$$\left.\begin{aligned} \omega &= 357^\circ\ 42'\ 49''\!\cdot\!9 \\ \Omega &= 78\ \ 19\ \ 40\cdot6 \\ i &= 18\ \ 12\ \ 59\cdot8 \end{aligned}\right\}\text{Mean Equinox } 1867\cdot0.$$

$\log q =$ 0·1991244.

$\log e =$ 9·9451467.

Period = 48·7 years.